WATER SUPPLY AND SANITATION IN RURAL AREAS OF INDONESIA

Sumengen Sutomo,* Sidik Wasito,* Kumoro Palupi*, Sofyan*,
Titiek Santoso*, Titiek Setyowati*, Abuzar A**.

ABSTRAK

Data mengenai sarana air minum dan pembuangan kotoran diperlukan untuk perencanaan program sarana air minum dan jamban keluarga (Samijaga) di daerah pedesaan. Sampai pertengahan tahun 1982 belum ada data yang baik mengenai sarana tersebut, sehingga perlu diperoleh dengan cara sampel survai.

Survai dilakukan di daerah pedesaan yang meliputi 9 provinsi dengan 8597 rumah tangga. Rumah tangga dipilih secara bertahap, dan tahap terakhir melalui *systematic random sampling*. Pengumpulan data dilakukan melalui wawancara dengan ibu rumah tangga menggunakan kuesioner, dan pengamatan langsung fasilitas Samijaga.

Dari sample rumah tangga didapat 28,3% memperoleh sumber air terlindung, dan 71,7% tidak terlindung seperti sumur gali, air hujan, kali, kolam, dan sumber lain. Dengan kriteria saniter, terdapat 12,2% rumah tangga yang telah memperoleh sumber air saniter, dan sisanya 87,8% memperoleh sumber air tidak saniter.

Rumah tangga yang telah memperoleh sarana pembuangan kotoran dengan jamban adalah 36,7%, dan 63,3% masih membuang kotoran di sembarang tempat seperti di kebun, kolam, ladang, semak, kali, dan lain-lain. Dengan kriteria saniter terdapat 10,2 % rumah tangga menggunakan jamban saniter, dan 89,8% rumah tangga membuang kotoran di sembarang tempat.

INTRODUCTION

The program for water supply and sanitation in the rural areas of Indonesia has been conducted by the Ministry of Health through the Directorate General of Cummunicable Disease Control for more than 13 years. The purpose of this program is to provide a safe water supply and adequate sanitation facilities for the rural population, especially in reducing morbidity and mortality due to cholera, dysentry, typhoid, para typhoid fever, diarrheal disease, etc.[1]

Although the program for water supply and sanitation has been carried out for many years, there is little information available on the accessibility of safe water supply and adequate sanitation facilities for the rural population. Many efforts estimated the situation with regards to water supply and sanitation in the rural areas. The Directorate General of Communicable Disease Control estimated the accessibility of safe water supply and adequate sanitation facilities through the Provincial Health Services, Regency Health Services, and Health Centers. However, the data did not describe the real situation that pertained to the population. The Central Bureau of Statistics indicated the national situation, but it has a different criteria for safe water supply and adequate sanitation facilities. Many studies estimated the situation, but most of them were limited to certain province or regency.

A national sample survey was carried out in order to obtain better information on the extend of safe water supply and adequate sanitation facilities. This survey

* National Institute of Health Research & Development, MOH, Jakarta.
** Central Bureau of Statistics.

was conducted in October 1982 to provide basic information on the state of water supply and sanitation facilities in the rural areas of Indonesia.

MATERIAL AND METHODS

Since most of the population lives in Java and Bali, all provinces in these islands were included in this survey. Provinces outside of Java and Bali were selected using several criteria such as the size of the population, population density, variability of the program for water supply and sanitation. Limitation of resources such as budget, manpower, times and accessibility of transportation were also considered in selecting the provinces.

The sample size was composed of people who lives in the rural areas which were selected using the above criteria. The household was selected as a sampling unit. The selection of households was through a stratified sampling methods proportional to size [2, 3, 4]. Data from each household include household identification, type of source of water, type of excreta disposal facilities, and its sanitary condition of both facilities.

Data were collected using questionnaire which consisted of a list of either open or close questions to obtain data on water supply and sanitation facilities. Pretest of the questionnaire was in Kecamatan Kedung Halang, Bogor. Data collection activities were carried out by sanitarians from the provinces ranging in age from the twenties to the thirties.

To determine the accessibility of water supply and sanitation facilities, two criteria and several terms were used. These include the terms of improved or safe for water supply, and improved or adequate for sanitation. Safe water supply includes treated water or untreated but uncontaminated water such as a protected spring with piping system or protected spring[5]. Less safe water supply includes springs, deep well pumps, shallow well pumps, dug wells, and rain water. Unsafe water supply is other sources of water of doubtful quality such as rivers, streams, ponds, and other insanitary facilities. Improved water supply includes a spring with piping system, protected springs, deep well pumps, shallow well pumps, rain water, and dug wells. Not improved water supply is similar to unsafe facilities. Adequate sanitation is access to sanitary excreta disposal facilities such as water seal latrines. Less adequate sanitation is access to other type of excreta disposal facilities such as borehole latrines or overhung latrines. Inadequate sanitation includes other type of insanitary facilities such as garden, yards, rivers, streams, ponds and other traditional facilities. Improved sanitation facilities include water seal latrines, borehole latrines, overhung latrines and other types of improved facilities. Not improved facilities are smiliar to inadequate facilities. Data were processed and analyzed using statistical computer program, the Michigan Active Data analyzed System at the University of Michigan Arbor USA[6].

RESULTS

This survey comprised 9 provinces, 33 regencies, 106 districts, 367 villages, and 8597 households. Number of the households in each provinces is shown in Table 1. The provinces selected in this survey are shown in Figure 1

Table 1. Number of households included in the sample by province.

Province	Regency	District	Village	Households	
				Sample	Response
West Java	4	12	47	1100	1096
Central Java	4	12	47	1100	1022
East Java	4	11	49	1100	1055
B a l i	4	12	44	1000	940
North Sumatra	4	12	14	1000	928
West Sumatra	4	12	51	1000	866
Lampung	3	12	43	1000	943
West Kalimantan	2	11	33	1000	887
South Sulawesi	4	12	39	1000	860
	33	106	367	9300	8597

* including Yogyakarta

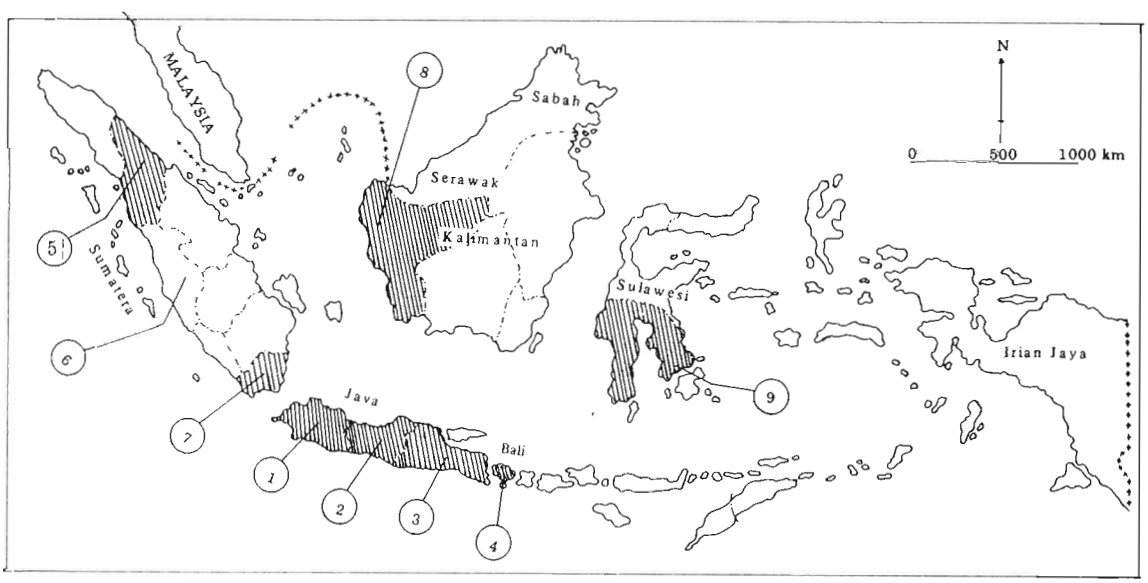

Figure 1. Nine provinces selected in this survey include 1. West-Java, 2. Central-Java, 3. East Java, 4. Bali, 5. North-Sumatra, 7 Lampung, 8 West-Kalimantan, and 9. South-Sulawesi.

The sample size was 9300 households, and 8597 households were successfully interviewed. The household non reponse rate was 7.6 percent with a response rate of 92.4 percent. Several reasons for non response were: some respondents were not at home at the time of interviews, the households were empty, the address were not correct, the households were difficult to reach due to lack of transportation facilities, and refusal of interviews. There were no substitutes for these non responses.

With regard to the situation on water supply and sanitation, Table 2 shows the classification of households by source of water supply, and Table 3 shows the classification of households by sanitation facilities. The number and prercentage of households for water supply and sanitation are shown in Figure 2.

Table 2. Households by source of water.

Source of water	Households	(%)
Spring with piping	548	(6.5)
Protected spring	492	(5.8)
Spring	1088	(12.8)
Deep well pump	107	(1.3)
Shallow well pump	169	(2.0)
Dug well	4069	(47.9)
Rain water	803	(9.5)
River, stream	908	(10.7)
Pond	169	(2.0)
Other	147	(1.7)
TOTAL	8500	(100.0)

Table 3. Housholds by sanitation facilities

Sanitation facilities	Households	(%)
Water seal latrine	863	(10.2)
Borehole latrine	1901	(22.6)
Overhung latrine	332	(3.9)
Garden, yard	952	(11.3)
Pond	558	(6.6)
Rice field	542	(6.4)
River, stream	2320	(27.5)
Bush	388	(4.6)
Other	572	(6.8)
TOTAL	8428	(100.0)

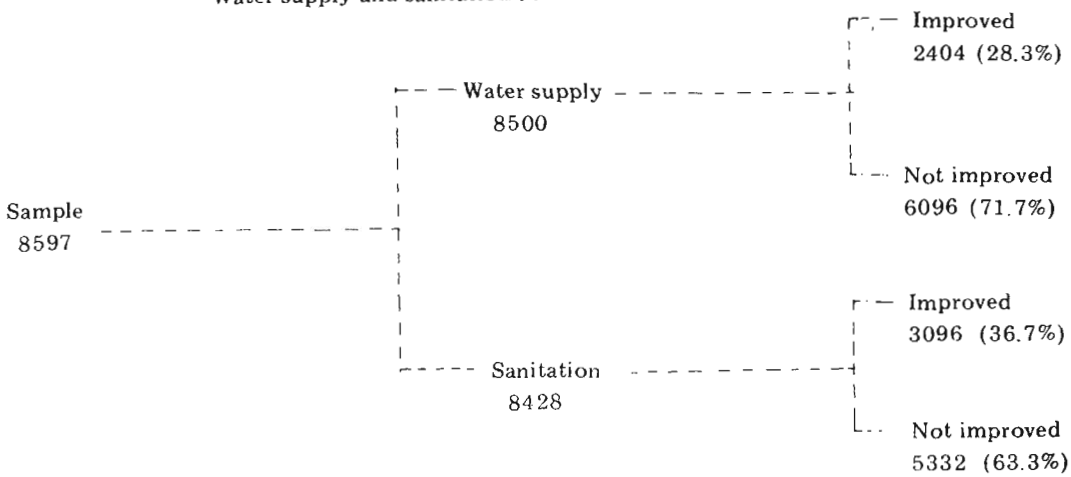

Figure 2. Hoseholds by the criteria of improved or not improved facilities.

Out of 8500 households, 28.3 percent had access to improved water supply, using a spring with piping, protected springs, deep well pumps, and shallow well pumps; 71.7 percent did not have access to improved facilities using rain water, dug wells, rivers, streams, ponds, and others. The number of households which had access to improved sanitation facilities was 36.7 percent, using water seal latrines, borehole latrines, and overhung latrines, and 63.3 percent did not have access to improved facilities, using rivers, gardens, and other insanitary facilities. The number and percentage of households for water supply and sanitation using another criteria are shown in Figure 3.

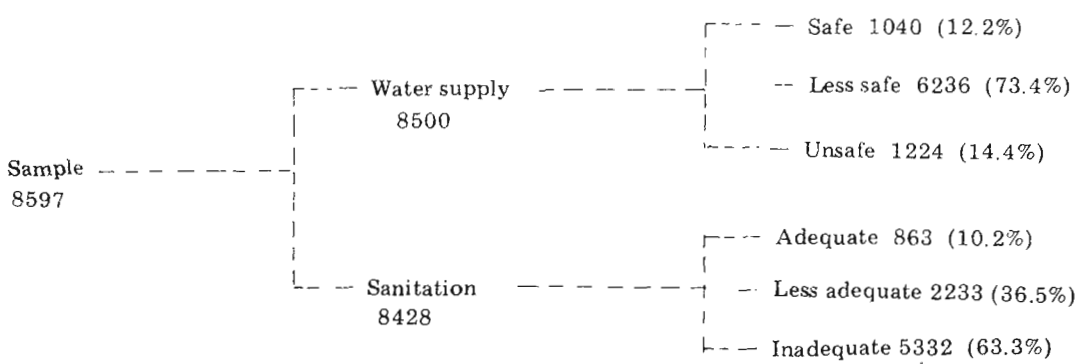

Figure 3. Households by the criteria of safe water supply and adequate sanitation facilities.

Out of 8500 households, 12.2 percent had access to safe water supply, using spring with piping system and protected springs; 73.4 percent had access to less safe water supply, using springs, deep well pumps, shallow well pumps, rain water, dug wells; and 14.4 percent had access to unsafe water supply, using rivers, streams, ponds and other insanitary facilities. The number of households which had access to adequate sanitation was 10.2 percent, using water seal latrines; those which had access to less adequate sanitation was 26.5 percent, using borehole latrines, and overhung latrines; and those which had access to inadequate sanitation was 63.3 percent, using gardens, ponds, rice fields, rivers, or other insanitary facilities.[7]

DISCUSSION

The number of household successfully interviewed was 92.4 percent, and the non response rate was 7.6 percent. Many household surveys lost some of sample due to non responses. A response rate of 86 percent is considered as a good rate for a personal interview survey [8,9].

The situation on water supply indicates that the households in rural areas had access to several types of source of water such as springs, wells, rain water, rivers or streams, ponds, and other insanitary facilities. They used water from these sources for drinking, cooking, bathing, and other purposes. In the rainy season and dry season, the people obtain water from the same sources as for domestic purposes. The preferred sources of water was dug wells and springs. Out of 8500 households, 47.9 percent used dug wells, and 12.8 percent used unprotected springs. Many people prefer using dug wells, because they were inexpensive, can be built in any place, either around or in the house at any time using local technology and facilities. Some people prefer using spring because they were naturally existing, with no cost, and for traditional or cultural reasons.

Further classification used the term improved and safe for water supply. The term improved water is similar with the term safe water defined by the WHO in 1976. Out of 8500 households, 28.3 percent had access to improved facilities such as springs with piping, protected springs, springs, deep well pumps, and shallow well pumps. Those which did not have access to improved facilities was 71.7 percent, and they had access to facilities such as dug wells, rain water, rivers, ponds, and other insanitary facilities.

In 1975, it was estimated that only 4.3 percent of the rural population served with safe water supply, and 95.7 percent without safe water supply [10,11]. A survey conducted by the Directorate of Hygiene and Sanitation, Ministry of Health and UNICEF in 1976, reported that 6 percent of the rural population had access to safe water supply such as piping system, well pumps, rain water catchment facilities, and protected springs. The Central Bureau of Statistics in 1980 reported that 11.2 percent of the population had access to piped water supplies[12]. There has been an increase in the proportion of the people who had access to improved facilities in 1982 as compared with the previous year. However, there were still many people did not have access to improved facilities, and most of them used insanitary facilities.

Another sanitary classification used the terms safe, less safe, and unsafe facilities. These terms were different from the WHO's definition, and defined more strictly. For example, in the WHO's (1976) definition spring was included in safe water, but in this survey categorized

in less safe water. However, either definition based on the same general concept of disease transmission. The number of household which had access to safe water was 12.2 percent, they used water from a spring with piping system and protected springs which constructed in sanitary manner. Those which had access to less safe water was 73.4 percent, they used water from springs, deep well pumps, shallow well pumps, dug wells, and rain water. Those which had access to unsafe water was 14.4 percent, they used water from rivers, ponds, and other insanitary facilities. The Central Bureau of Statistics reported that the population which had access to piping system and spring vary from 21 to 24 percent. There has been a slight increase of the proportion for the population which had access to safe water supply.

The households in the rural areas had access to several types of excreta disposal facilities such as water seal latrines, borehole latrines, overhung latrines, disposal in the gardens, ponds, rice fields, rivers, or streams, and other insanitary facilities. The preferred facilities were rivers and borehole latrines. Out of 8428 households, 27.5 percent used rivers and 22.6 percent used borehole latrines. The reasons that many people prefer using rivers for excreta disposal facilities were no cost, easy to do, naturally exist, traditional and cultural reasons. In addition, some people prefer using borehole latrines due to the reasons such as easy to build, close to the house, and inexistance of better facilities.

Further classification indicates that 36.7 percent households had access to improved sanitation facilities such as water seal latrines, borehole latrines, and overhung latrines. Those which did not access to improved facilities was 63.3 percent, and they had access to facilities such as rivers, gardens, and other insanitary facilities. In 1970 it was estimated that 4 percent of the rural population served with adequate excreta disposal facilities, and the percentage rose to 5.1 percent in 1975. While 94.9 percent of the rural population lived without adequate excreta disposal facilities[11,13]

Survey conducted by the Directorate of Hygiene and Sanitation, Ministry of Health and UNICEF in 1976 reported that 18 percent of the rural population had latrines for their excreta disposal facilities. The household survey in 1980 reported that about 26.9 percent of the rural pupulation had access to excreta disposal facilities such as latrines, and the rest of the population used rivers, streams, bushes, and other insanitary excreta disposal facilities[14,15]. There has been an increase in the proportion of the population which had access to improved sanitation facilities in 1982 as compared with 1980. However, there were still many people did not have access to improved facilities, and most of them used insanitary facilities.

Another sanitary classification indicates that the number of household which had access to adequate sanitation facilities was 10.2 percent, those which had access to less adequate facilities was 26.5 percent, and those which had access to inadequate facilities was 63.3 percent. The Central Bureau of Statistics reported the accessibility of private facilities to the rural population about 21 percent. Assuming the private facilities were adequate disposal facilities, there has been an increase of the proportion for those which had access to adequate sanitation facilities. However, this proportion was still very low, since most people used inadequate excreta disposal facilities.

In conclusion, the proportions of the population in rural areas who had access to safe water supply and adequate sanitation facilities were still very low. Most of

the households had access to less or unsafe water supply and inadequate sanitation facilities. It is recommended that the provision of safe water supply or sanitation facilities should be increased in order to reduce the risk of having diseases that transmitted by water and excreta. In order to provide reliable information on the accessibility of safe water and adequate sanitation in the rural areas, a similar survey should be carried out regularly at least for the period of five years.

ACKNOWLEDGEMENTS

Many people involved in this survey, and they were from the National Institute of Health Research and Development, Directorate General of Communicable Disease Control, Bureau of Statistics, Bureau of Planning, Provincial Health Services, Regency Health Services, and Health Centers. Without their participation, data collection activities would not have been completed.

For this reason, we would like to thank to the persons at the Ministry of Health Dr. A.A. Loedin MD, Head of the NIHRD for giving an opportunity and financial support to carry out this survey, I.F. Setiady MD, Director of Health Ecology Research Center, for his invaluable assistance and administrative support. The Directors of Provincial Health Services, Regency Health Services, and Health Centers in the area of study for their supports in the planning stage and data collection activities. The Directors School of Sanitation and School of Nursing in Padang for providing the interviewers and training facilities. At the Central Bureau of Statistics, the Diractor of CBS and his Staff in the Central Office, Provinces, Regencies, and Districts for their supports in sampling selection of the households. We are indebted to the sanitarians and nurses who participated in data collection activities and all those whose efforts contributed to the success of this survey.

REFERENCES

1. Departemen Kesehatan Republik Indonesia (1975). *Petunjuk Pelaksanaan Instruksi Presiden RI No. 7 tahun 1975, tentang Pelaksanaan Program Bantuan Pembangunan Sarana Kesehatan* p. 70—75.
2. Cochran (1963). *Sampling Techniques.* John Wiley & Sons, Inc. New York p. 71—86.
3. Babbie Earl R. (1975). *The Practice of Social Research* p. 319—327.
4. Backstrom Charles H. and Gerald Hursh Cesar (1981). *Survey Research.* John Wiley & Sons. *p. 35—102.*
5. World Health Organization (1976). Community water supply and waste water disposal Mid - Decade Progres report. Report by the Director General Twenty ninth WHO Assembly May 6, 1976, Annex 1 p.1
6. Fox Daniel J., Kenneth E. Guire (1976). *Documentation for Midas.* Statistical Research Laboratory. The University of Michigan p. 120—179.
7. Sutomo Sumengen (1986). Water Supply, Sanitation, and Diarrheal Diseases in Rural Areas of Indonesia, Dissertation, School of Public Health University of Michigan p 1—144.
8. Warwick Donald P and Charles A Lininger (1975) The sample survey. Theory and Practice. Mc Graw Hill Book Company, New York p. 265—327.
9. Babbie (1973). *Survey Research Methods.* Wadsforth Publishing Company Inc. Belmont, California p. 187—203.
10. World Health Organization (1976). *World Health Statistics Report. Water and Sanitation.* Vol. 29 No. 10: p. 570—580.

11. Reyes Wilfredo L., Somnuek Unakul, Michael Acheson (1978). *Research in the Development of Appropriate Technology for the Improvement of Environmental Health at the Village Level.* WHO Regional Office South East Asia p. 2—39.
12. Biro Pusat Statistik Jakarta (1982). *Statistik Indonesia.* Statistical Year Book of Indonesia XLV—LII, p. 45—51.
13. World Health Organization, International Bank for Reconstruction and Development, IBRD/WHO Cooperative Program (1977). *Republic of Indonesia. Water Supply and Sanitation Sector Studies Report.* Vol 1 of 2 p. 10--11. Annex 5 p. 9—10.
14. Budiarso L. Ratna, J. Putrali, and Muchtaruddin (1980). *Laporan Survai Kesehatan Rumah Tangga 1980.* Departemen Kesehatan R.I, Badan Penelitian dan Pengembangan Kesehatan, Puslit Ekologi Kesehatan p. 45—50.
15. Budiarso L. Ratna (1980). *Survey Rumah Tangga 1980. Data Statistik* Departemen Kesehatan Republik Indonesia. Badan Peneltian dan Pengembangan Kesehatan, Puslit Ekologi Kesehatan p. 27—81, 92--104.

***